

## THE EXPERIMENTAL WOUND HEALING USING COFFEE POWDER AND HONEY COMPARED TO NPWT

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### ABSTRACT

*Today the Negative Pressure Therapy (NPWT) applied to treat wounds. The procedure needs to criticize because not simple, expensive, use only by doctors, and limited availability.*

*The wound treatment using Robusta coffee powder compared to honey, NPWT, and control groups. The wound sized 2cmx2cmx0.20 cm made at the back skin. Each wound infected by 1 ml. of a bacterial suspension of Staphylococcus aureus ATCC 25923. The grade of epithelialization, angiogenesis, collagenization, on the 7<sup>th</sup> day, 14<sup>th</sup> day, were observed. The randomized observational cohort analytic research conducted in 250 gram-Wistar rats divided into three groups, each group of 5 rats. On the 7<sup>th</sup> day and the 14<sup>th</sup> day, the wound biopsied and put into formalin solution. The epithelial cell growth inspected using 200 x-magnification. The healing parameter using the grade of epithelialization 3=normal, grade 2=low epithelialization, 1=no growth; grade of angiogenesis 3=more than two new blood vessels; 2=one to two blood vessels; 1=no new blood vessel; grade of collagenization 3=more than normal collagen density; 2=the same with normal collagen density; 1=low than normal collagen density.*

*Data analysis using the Kruskal-Wallis test. Statistics analyzed using SPSS 24.0; p-value < 0.05 considered significant.*

*The grade of epithelialization, angiogenesis, collagenization were not statistically significant in the 7<sup>th</sup> day groups of control, Robusta coffee, honey, NPWT, with p=1.000. In the 14<sup>th</sup> day groups of control, Robusta coffee, honey, NPWT, the epithelialization, and angiogenesis have p=1.000, and the collagenization on the 14<sup>th</sup> day has p=0.271.*

### CONCLUSIONS

*The wound healing using coffee powder or honey was not different compared with NPWT.*

**KEYWORDS:** Wound Healing, Staphylococcus Aureus ATCC 25923, Robusta Coffee, Honey & NPWT

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## INTRODUCTION

The wound care method in this modern time is among others using Negative Pressure Wound Therapy (NPWT) which developed in the world since the 1980s.<sup>1</sup> The NPWT also called subatmospheric pressure therapy, vacuum sealing, vacuum pack therapy, and sealing aspirative therapy, is applied to acute and chronic wounds.<sup>1</sup> The wound care method needs to evaluate because the NPWT procedure is complicated, high in price, use only by doctors, and limited availability.<sup>1,2</sup> Negative pressure has proven its ability to suck infected wound fluid, stimulates the formation of granulation tissue to accelerate healing.<sup>1,2</sup> Coffee and honey powder have long been known as traditional wound treatments that are effective, inexpensive, and are procedures that are easily done by anyone

else.<sup>3,4,5,6</sup> Honey as a traditional treatment has many benefits for wound healing.<sup>5,6</sup> According to those advantages we want to study the comparison of experimental wound healing process using coffee powder, honey, and NPWT.

## **MATERIALS AND METHODS**

### **Experimental Trial**

The study approved by the institution's ethical committee no.347/Komite Etik.FK/III/2018.

### **Design Study**

The experimental study is a randomized observational analytic research with cohort approach.

The experimental procedures exceeded the World Medical Association Declaration of Helsinki.

### **Animal Study**

Animal conducted in 250 gram-Wistar rats (*Rattus norvegicus*) randomize divided into three groups, each group of 5 rats.

The 1<sup>st</sup> experimental study consisted of honey, NPWT, control groups.

The 2<sup>nd</sup> experimental study consisted of robusta coffee powder, NPWT, control groups.

Before surgery to made incision the rat's anesthesia with Ketamine injection. Each rat made in its back the wound sized 2cmx2cmx0.20 cm, then each wound infected by 1 ml of a bacterial suspension (McFarland 0.5) of *Staphylococcus aureus* ATCC 25923.

### **The Observation Times**

The observations were carried out at the 7th day and the 14<sup>th</sup> day, and the wound removed (biopsied) specimen put into formalin solution and sent to Department of Pathology in Dr. Hasan Sadikin General Hospital for histology examination using the light microscope with 200 x-magnification by a certified pathologist.

### **Healing Parameter Score**

The healing parameter is obtaining the class of epithelialization (the 1<sup>st</sup> parameter) 3=normal (75-100%), grade 2=low epithelization (50-75%), 1=no growth (0-50%); the grade of angiogenesis (the 2<sup>nd</sup> parameter) 3=more than two new blood vessels; 2=one to two blood vessels; 1=no new blood vessel; grade of collagenization (the 3<sup>rd</sup> parameter) 3 (75-100%)=more than normal collagen density; 2 (50-75%)=the same with normal collagen density; 1 (0-50%)=low than normal collagen density.

The healing sign showed the wound to be dry as the 4<sup>th</sup> parameter.

### **Coffee, Honey, and NPWT**

The Robusta coffee powder bought from the Aroma Coffee shop in Bandung. The honey was a local product got from the Perhutani Honey shop in Bandung. The Robusta coffee powder poured about 1 teaspoonful for every wound and wrapping with a gauze roll, and every three days changed to a new one.

The honey for the experiment got from the supermarket in Bandung, about half teaspoonful put on the wound and closed by gauze wrapping, and every 2-3 days changed a new one.

The NPWT was done applying a modified suction apparatus that can provide the negative pressure to -100mmHg. The wounds interruptedly suctioned to -20mmHg for 15 seconds and free 1 minute for three times a day and three days a week. The wounds were not bleeding when the NPWT conducted. The position of the cup of NPWT apparatus was not directly in contact with the wound surface, but there was a 2mm-thick sheet of foam that limits.

### Statistical Analysis

The comparative data more than two groups analyzed using Kruskal-Wallis test applying SPSS version 24.0. The p less than 0.05 regarded significant.

## RESULTS

The results showing in Table 1 have described that the healing process did not statistically differ between the groups ( $p > 0.05$ ). Statistical analysis does not find any differences between the groups.

The wounds on the 7<sup>th</sup> day were dry in the coffee group, NPWT group, and control group.

On the 14<sup>th</sup> day all wounds were already dry, then the NPWT was not applied to the wounds, but coffee gave to the wound as well as honey in its group. The wounds were dry almost at the same time. The wounds in the coffee group and NPWT group were dry fastest than wounds in the honey group. The wounds with honey last to dry for the fluid effect of the honey somewhat complicate the assessment.

The wounds were dry the mean of coffee on the 3<sup>rd</sup> day, control group on the 4<sup>th</sup> day, NPWT group on the 5<sup>th</sup> day. The mean of the honey group wounds was dry on the 10<sup>th</sup> day.

**Table 1: Epithelialization, Angiogenesis, Collagenization in Day-7 and Day-14**

Parameter		Control n=5	Coffee n=5	Honey n=5	NPWT n=5	P
Epithelialization Day-7	Median	1.00	1.00	1.00	1.00	1.000
	Range (min-max)	0-1.00	0-1.00	0-1.00	0-1.00	
Angiogenesis Day-7	Median	3.00	3.00	3.00	3.00	1.000
	Range (min-max)	3.00	3.00	3.00	3.00	
Collagenization Day-7	Median	1.00	1.00	1.00	1.00	1.000
	Range (min-max)	1.00	1.00	1.00	1.00	
Epithelialization Day-14	Median	1.00	1.00	1.00	1.00	1.000
	Range (min-max)	1.00-2.00	1.00-2.00	0.00-2.00	1.00-2.00	
Angiogenesis Day-14	Median	3.00	3.00	3.00	3.00	1.000
	Range (min-max)	3.00	3.00	3.00	3.00	
Collagenization Day-14	Median	2.00	1.00	2.00	1.00	0.271
	Range (min-max)	1.00-3.00	1.00-3.00	1.00-3.00	1.00-2.00	

## DISCUSSIONS

The coffee powder has a strong antibacterial capacity that stronger than honey, and both had almost the same working mechanism against inflammation and bacterial infection.<sup>3,6</sup> Both produced hydrogen peroxide and hyperosmolar liquid when it mixed with wound fluids.<sup>2,3,6</sup> The honey has a fluidity manner that tends to flow out the wound, but coffee powder inclines to stay in place. The coffee will dissolve in wound fluids and coloring the gauze; the honey also gives a yellow color to the gauze. The coffee is the only one wound dressing that generates a lovely aroma, and it is the benefits the only coffee has. The advantages coupled with coffee's ability to improve skin microcirculation, stop bleeding, cause coffee to be a complete wound dressing that does not interfere with newly grown cells in the healing process.<sup>3,7</sup>

The NPWT method could absorb the bacterial fluid in the wound surface with the negative pressure provides a capacity against infection, although the negative pressure could harm the new growing cells in the wound surface.<sup>4</sup> The NPWT group was the group where the intervention (micro deformation) existed to the cells significantly compared to the other groups.<sup>2</sup>

The rats in the control group with its natural physical capacity accommodate the healing process in the infected wounds. The natural immune supported for healing by coffee powder (in the coffee group), honey, and also negative pressure in the NPWT group. The study demonstrates the wound healing process in the control group was without any assistance. However, then the wound healing develops almost the same as in other groups probably by its physical immune fervency. The healing process in the group of coffee and honey should be much speed up because both can help to sustain against bacterial infection, and any inflammation.<sup>3,4</sup>

The good results of coffee powder and honey used in the study emphasized that both traditional dressings are possible to apply safely in wound healing and confirm the results which have published in several journals.

## CONCLUSIONS

The treatment of wound using coffee or honey was not different from the treatment of wound using NPWT.

## CONFLICT OF INTEREST

The authors confirm the article has no conflict of interest.

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